DCS & Labelling Worldwide

D512 PCL PROGRAMMING MANUAL

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WARNING

THE EQUIPMENT REFERENCED IN THIS DOCUMENT COMPLIES WITH THE REQUIREMENTS IN PART 15 OF FCC RULES FOR A CLASS B COMPUTING DEVICE. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA MAY CAUSE UNACCEPTABLE INTERFERENCE TO RADIO AND TV RECEPTION.

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PCL EMULATION

The D512 printer supports the Hewlett-Packard Company's LaserJet Printer Command Language. This chapter discusses PCL emulation commands, along with resident PCL emulation font and symbol set support.

To determine which commands your printer supports, see Section, "PCL Support."

SELECTING PCL EMULATION

USING YOUR SOFTWARE PROGRAM

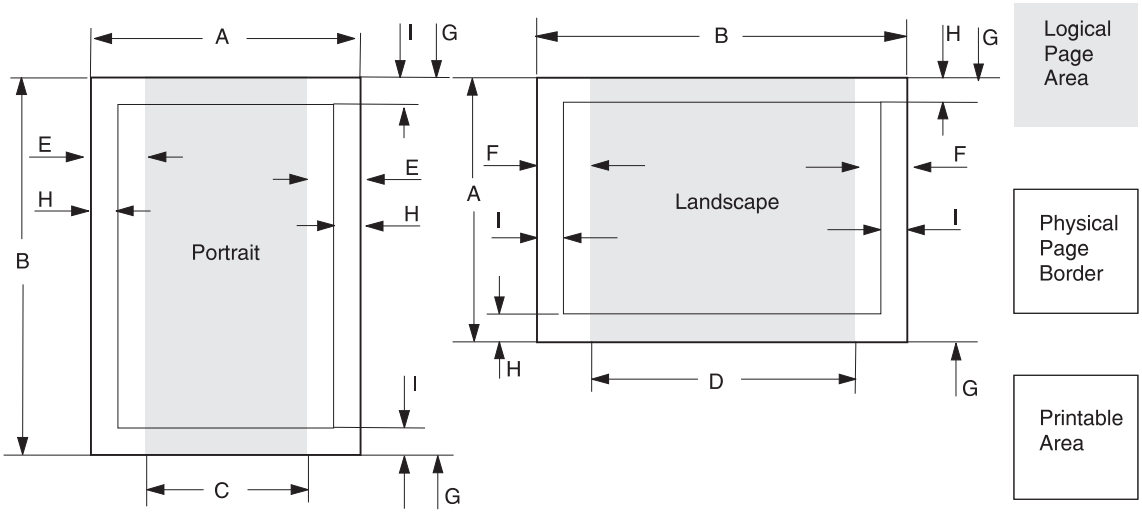
The D512 requires a PJL prologue, or series of commands, at the start of each print job, including the Printer Job Language (PJL) Enter Language Command. See "ENTER LANGUAGE Command" in Printer Job Language section for more information. See "Printer Job Language" in the Printer Job Language section for the syntax and use of PJL. An example of a well-structured PJL prologue would be the following:

```
[esc]%-12345X
@PJL SET LCUSTOMPAPERUNITS=INCHES
@PJL SET LCUSTOMPAPERHEIGHT=6
@PJL SET LCUSTOMPAPERWIDTH=4
@PJL SET RESOLUTION=300
@PJL ENTER LANGUAGE=PCL
```

PAGE FORMATTING

The printable areas and logical pages for PCL emulation (both portrait and landscape orientation) are illustrated below. See the Legend that follows for definitions of areas A through I.

PRINTABLE AREAS



Legend:

A Portrait physical page width and landscape physical page length
B Portrait physical page length and landscape physical page width
C Portrait logical page width
D Landscape logical page width
E Distance between the side edge of the physical page and the logical page in portrait
F Distance between the side edge of the physical page and the logical page in landscape
G Distance between the top and bottom edge of the physical page and logical page
H Distance between the left and right edge of the physical page and the printable area in portrait, or distance between the top and bottom edge of the physical page and printable area in landscape
I Distance between the top and bottom edge of the physical page and the printable area in portrait, or distance between the left and right edge of the physical page and the printable area in landscape

FONT AND SYMBOL SET SUPPORT

Your printer has 10 resident scalable PCL fonts.

Several parameters are used to select a font from the data stream. These include symbol set, spacing, point, or pitch, style, weight, and typeface number. For scalable fonts, you can vary the size of a font by specifying pitch or point size (point size for proportional fonts, pitch for fixed space fonts.

A *symbol* set defines which characters are available for a font and the code point for each of these characters. Your printer supports 16 resident symbol sets. The table beginning on page 1-5 shows the symbol sets available for each font in PCL emulation. Not all fonts support all symbol sets.

STANDARD PCL EMULATION FONTS

The following table lists the parameters to be used in the font selection commands for each of the10 standard PCL emulation fonts.

Table 1-1: Forward and Backward Compatibility Font Selection Commands

Standard PCL Emulation Font Name	Forward and Backward Compatibility Mode			
	Spacing	Style	Weight	Typeface
Courier Regular	0	0	0	4099
Univers Medium	1	0	0	4148
Univers Bold	1	0	3	4148
CG Triumvirate Condensed Bold	1	4	3	4100
Roman Pillar Regular	0	0	0	30211
Roman Pillar Italic	0	1	0	30211
Roman Pillar Bold	0	0	3	30211
Roman Pillar Bold Italic	0	1	3	30211
OCR-A	0	0	0	23584
OCR-B	0	0	0	23590

SELECTING SYMBOL SETS FOR THE SATO D512

To determine if a font or typeface supports a symbol set, see the complete listing of PCL emulation fonts and symbol sets in the table below.

Table 1-2: PCL Emulation Symbol Sets

Typeface / Symbol Set	US Ascii (0U)	Windows Latin 1 (19U)	Windows Latin 1 (9E)	Windows Latin 1 (5T)	Windows Latin 1 (19L)	Windows Cyrillic (9R)	Windows Greek (9G)	ISO8859-1 (0N) (Latin 1)	ISO8859-2 (2N) (Latin 2)	ISO8859-9 (5N) (Latin 5)	ISO8859-10 (6N) Latin 6)	ISO8859-5 (10N) Cyrillic)	Roman 8 (8U)	IBM CP850 (12U)	OCR-A (0O)	OCR-B (1O)
Symbol Set ID	0U	19U	9E	5T	19L	9R	9G	0N	2N	5N	6N	10N	8U	12U	0O	1O
Courier Regular																
Univers Medium																
Univers Bold																
CG Triumvirate Condensed Bold																
Roman Pillar Regular																
Roman Pillar Italic																
Roman Pillar Bold																
Roman Pillar Bold Italic																
OCR-A																
OCR-B																

Indicates Typeface supports the specified Symbol Set.
Indicates Typeface does not support the specified Symbol Set.

COMMAND STRUCTURE

This section introduces the different types of PCL emulation commands and their structure, or syntax. It also demonstrates how you can link commands to abbreviate them.

CONTROL CODES

Control Codes are single-character instructions.

Table 1-3: Control Codes

Code	Dec	Hex	Function	Result
BS	8	08	Backspace	Moves the cursor toward the left margin one horizontal space equal to the last printed character
HT	9	09	Horizontal Tab	Moves the cursor to the next defined tab stop
LF	10	0A	Line Feed	Advances the cursor to the same horizontal position on the following line as determined by either the Vertical Motion Index (VMI) or Set Line Spacing command
FF	12	0C	Form Feed	Advances the cursor to the same horizontal position at the top margin of the next page
CR	13	0D	Carriage Return	Moves the cursor to the left margin
SP	32	20	Space	Moves the cursor to the right one column
SI	15	0F	Primary Font	Selects the primary font
SO	14	0E	Secondary Font	Selects the secondary font

COMMANDS

PCL commands are multibyte strings (also known as “escape sequences”) that begin with the Escape control code (ESC, ¬, decimal 27, or hexadecimal 1B). The ESC control code notifies the printer that the characters that follow are to be interpreted as part of a command and are not control codes or data to be printed.

COMMAND STRUCTURE

Most PCL emulation commands have the following structure:

ESC & a # C

Spaces have been added to this example for readability. The command parameter variables are indicated by a number sign (#).

Table 1-4: Description of Command Structure

Element	Description
ESC	Decimal 27 or hex 1B
&	Parameterized character from American National Standard Code for Information Interchange (ASCII) table (ranging from 33 to 47 decimal)
a	Group character from ASCII table (ranging from 96 to 126 decimal) that specifies a group type of control
#	Decimal character string value within specified numeric ranges; may be preceded by a + or - sign and contain a decimal point
C	Termination character from ASCII table (ranging from 64 to 94 decimal)

COMMAND PARAMETERS

A command parameter sets the value for a command. This value stays constant until either a different value resets the command or a command resets the printer to the default values. For example, after the printer receives a command that selects a right margin beginning at column 63, the right margin of each printed page begins at column 63. That margin stays constant until a right margin command with a different value resets it or until the printer is reset.

Parameters for each command are listed in the command tables beginning on page 9. Use the Symbol Set Tables to determine the decimal or hexadecimal value for each parameter. To determine a decimal or hex value, first locate the value of the parameter you require in the Symbol Set Table. The decimal value is the value shown in the bottom of the cell or box with that parameter. To find a hex value, go straight up the grid from the desired parameter and read the value in the top heading. This is the first character of the hex value. Next, go straight across the grid to the left of the parameter and read the value in the left column heading. This is the second character of the hex value. For example, ESC (¬) is coded 1B in Hex and 27 in decimal. (Any one of the three values ¬, 1B, or 27 might be used in your application. Read your documentation to determine which to use.) The example sets the pitch of the primary font to16.66 characters per inch.

Example:
ESC(s16.66H
- Decimal: 27 40 115 49 54 46 54 54 72
- Hex: 1B 28 73 31 36 2E 36 36 48

Use the plus symbol (+) or the minus symbol (-) to select a position relative to the current cursor position. For example:

ESC&a6C	Move to horizontal cursor position, column six
ESC&a+6C	Move six columns to the right of the current position
ESC&a-6C	Move six columns to the left of the current position

LINKING COMMANDS

You can combine PCL emulation commands by linking them *if* the first 3 bytes of the commands are identical. The combined, short form sends the first 3 bytes only once in the string. To combine commands:

- Use the first 3 bytes (characters) of the command only once at the start of the command string.
- Make the last letter of each command in the string lowercase.
- Capitalize the last letter of the string.

For example, notice that the first 3 bytes of these two commands are the same:

ESC(s10H	Select 10 characters per inch
ESC(s4099T	Select Courier typeface

To combine these two commands, use this form:

ESC(s10h4099T

which is 3 bytes shorter than the long form:

ESC(s10HESC(s4099T

You can combine more than two commands; for example, you can add Select Stroke Weight Bold (ESC(s3B) to the previous two commands:

ESC(s10h3b4099T

or in the long form:

ESC(s10HESC(s3BESC(s4099T

PCL EMULATION COMMANDS

See the following tables for a listing of the commands grouped by function.

To determine which commands your printer supports, see “Table 3-1: PCL Emulation Commands” in the PCL Support section.

PCL EMULATION COMMANDS BY FUNCTION

Table 1-5: Job Control

Command / Parameters	Function / Result
-ESCE	**Printer Reset** • Prints any partial pages. • Resets printer environment to defaults. • Deletes all temporary downloaded resources.
ESC&d#A 0 = Collation off 1 … 999 (number of Copies)	**Number of Collated Copies** Turns collation of pages off or sets the number of collated copies.
ESC&ℓ#X # = number of Copies (1 to 32767) Default = 1	**Number of Copies** Affects the page currently in process and subsequent pages.
ESC&ℓ#S	**Simplex/Duplex Print** This command is parsed and ignored.
ESC&ℓ#U # = number of Decipoints Range = -32767 to 32767 (1 Decipoint = 1/720 inch) Default = 0	**Long-Edge Offset Registration** Also known as Left Offset. Adjusts placement of logical page along the width of the physical page.
ESC&ℓ#Z # = number of Decipoints Range = -32767 to 32767 (1 Decipoint = 1/720 inch) Default = 0	**Short-Edge Offset Registration** Also known as Top Offset. Adjusts placement of logical page along the length of the physical page.

Table 1-5: Job Control (continued)

Command / Parameters	Function / Result
ESC&u#D Range = 300	**Unit of Measure** Sets the size for the PCL Unit (units per inch). The Unit of Measure defines the unit used in the following commands: • Horizontal Cursor Position by PCL Unit (ESC*p#X) • Vertical Cursor Position by PCL Unit (ESC*p#Y) • Horizontal Rectangle Size by PCL Unit (ESC*c#A) • Vertical Rectangle Size by PCL Unit (ESC*c#B) The Unit of Measure also affects the rounding of character escapements and the Horizontal Motion Index. **Note:** This command does not affect the interpretation of binary raster data for bitmapped fonts, raster graphics, or user defined fill patterns.
ESC% – 12345X	**Universal Exit Language (UEL) / Start of PJL** This command terminates the current printer language and allows switching into PJL. For more information, see "UNIVERSAL EXIT LANGUAGE Command" in Section 2, Printer Job Language.

Table 1-6: Page Control

Command / Parameters	Function / Result
ESC&ℓ#A	**Set Page Size** This command is parsed and ignored.
ESC&ℓ#H	**Paper Source** This command is parsed and ignored.
ESC&f#G	**Set Universal Width** This command is parsed and ignored.
ESC&f#F	**Set Universal Height** This command is parsed and ignored.
ESC&f#O	**Set Universal Feed Direction** This command is parsed and ignored.
ESC&f#W [custom name] # = number of bytes in the custom name	**Set Universal Custom Name** This command is parsed and ignored.
ESC&ℓ#O 0 Portrait (Default) 1 Landscape 2 Reverse Portrait 3 Reverse Landscape	**Select Orientation** Specifies the position of the logical page with respect to the physical page. **Note:** This setting resets margins, the number of printable lines per page, and the cursor position.
ESC&a#P # = Degrees (0, 90, 180, 270) Default = 0	**Print Direction** Rotates the coordinate system counter-clockwise in 90° increments with respect to the current orientation. **Note:** Margins are not rotated or cleared.

Table 1-6: Page Control (continued)

Command / Parameters	Function / Result
ESC&c#T 0 Horizontal Printing -1 Vertical Rotated Printing	**Character Text Path Direction** Vertically rotates text for use in vertical writing, such as printing Japanese text.
ESC&a#L # = Column Default = 0	**Set Left Margin** Sets the left margin to the left edge of the designated column. **Note:** The column width is defined by the space character of the active font and the Horizontal Motion Index (HMI).
ESC&a#M # = Column Default = Logical Page Width	**Set Right Margin** Sets the right margin to the right edge of the designated column. **Note:** The column width is defined by the space character of the active font and the HMI.
ESC9	**Clear Horizontal Margins** Clears left and right margins.
ESC&ℓ#E # = number of lines Default = 3 (1/2 inch)	**Set Top Margin** Sets the number of lines between the top of the physical page and first line of print. Line height is determined by the current Vertical Motion Index (VMI) and/or line spacing value. **Note:** Setting a top margin of 0 results in the first line of text falling outside of the printable area.
ESC&ℓ1T	**Job Separation** This command is parsed and ignored.
ESC&ℓ#F # = number of lines Default = 60 or 64 (Country specific)	**Set Text Length** Sets the bottom margin length in lines, measured from the first line of the page. Text Length equals Logical Page Length –1 inch (–1/2 inch for top and –1/2 inch for bottom).
ESC&ℓ#G	**Set Output Bin** This command is parsed and ignored.
ESC&ℓ#L 0 Off 1 On (Default)	**Skip Perforation** Perforation area includes the area from the bottom margin of the current page to the top margin of the next page. When skipping perforations, a line feed past the bottom margin ejects a page and places the cursor at the top margin of the next page.
ESC&k#H # = number of 1/120 inch increments (Valid to 4 decimal places)	**Set Horizontal Motion Index (HMI)** Sets the width of all characters for fixed-space fonts. Sets only the width of the space for proportional spaced fonts.
ESC&ℓ#C # = number of 1/48 inch increments (Valid to 4 decimal places) Default = 8	**Set Vertical Motion Index (VMI)** Sets Vertical Motion Index in 1/48 inch increments. The VMI determines the vertical distance between lines. **Notes:** • Use of this command alters any previous Set Line Spacing command settings.

Table 1-6: Page Control (continued)

Command / Parameters	Function / Result
ESC&l#D 1 1 line/inch 2 2 lines/inch 3 3 lines/inch 4 4 lines/inch 6 6 lines/inch (Default) 8 8 lines/inch 12 12 lines/inch 16 16 lines/inch 24 24 lines/inch 48 48 lines/inch	**Set Line Spacing (Alternative Method)** Specifies VMI in lines per inch. **Notes:** • Unsupported values are ignored. • Use of this command alters any earlier VMI setting.
ESC&a#G	**Duplex Page Side Selection** This command is parsed and ignored.
ESC&l#P # = number from 0 to 14 0 = default page length is used (1 to 14 = new page length is set)	**Set Page Length** Sets the logical page length in number of lines. **Notes:** • This command is sent at the beginning of a page in a print job and prior to any printable data. • When the command is sent, the current page is closed and printed. • Unsupported values are ignored.
ESC&k#W	**Text Scale Mode** This command is parsed and ignored.

Table 1-7: Cursor Positioning

Command / Parameters	Function / Result
ESC&a#C # = number of Columns[1]	**Horizontal Cursor Position (in Columns)** Moves the cursor to a new position along the horizontal axis. **Note:** The column width is determined by the space character width of the active font or the Horizontal Motion Index (HMI), if set.
ESC&a#H # = number of Decipoints[1] (1 Decipoint = 1/720 inch)	**Horizontal Cursor Position (in Decipoints)** Moves the cursor to a new position along the horizontal axis.
ESC*p#X # = number of PCL Units[1]	**Horizontal Cursor Position (in PCL Units)** Moves the cursor to a new position along the horizontal axis. **Note:** PCL units are set by the Unit-of-Measure Command.
ESC&a#R # = number of Rows[1]	**Vertical Cursor Position (in Rows)** Moves the cursor to a new position along the vertical axis. **Note:** Row height is determined by either the Vertical Motion Index (VMI) or the Set Line Spacing Command.
ESC&a#V # = number of Decipoints[1] (1 Decipoint = 1/720 inch)	**Vertical Cursor Position (in Decipoints)** Moves the cursor to a new position along the vertical axis.
ESC*p#Y # = number of PCL Units[1]	**Vertical Cursor Position (in PCL Units)** Moves the cursor to a new position along the vertical axis. **Note:** PCL units are set by the Unit-of-Measure Command.
ESC=	**Half Line-Feed** Moves the cursor down 1/2 line (1/2 of the current VMI).
ESC&k#G 0 CR=CR, LF=LF, FF=FF (Default) 1 CR=CR+LF, LF=LF, FF=FF 2 CR=CR, LF=CR+LF, FF=CR+FF 3 CR=CR+LF, LF=CR+LF, FF=CR+FF	**Set Line Termination** Controls how the printer responds to the Carriage Return (CR), Line Feed (LF), and Form Feed (FF) control codes.
ESC&f#S 0 Push 1 Pop	**Push / Pop Cursor Position** Sets up a cursor position stack for storing and recalling various cursor positions. The stack can store up to 20 cursor positions.
[1] Parameter preceded by + or - sign denotes a relative cursor move from the current cursor position. Parameter without a sign denotes an absolute cursor move from the top left margin.	

Note: For the commands listed in the following table, font selection is based on all parameters set following the best fit selection rules.

Table 1-8: Font Selection

Command / Parameters	Function / Result
ESC(# (primary) ESC)# (secondary) # = symbol set ID	**Select Symbol Set** See Table 9-2 for the symbol sets which are supported.
ESC(s#P (primary) ESC)s#P (secondary) 0 Fixed (Default) 1 Proportional	**Select Spacing** Selects a font with proportional or fixed spacing.
ESC(s#H (primary) ESC)s#H (secondary) # = characters per inch Default = 10	**Select Pitch** Selects the number of characters per inch (cpi) for a fixed-space bitmapped or monospaced scalable font. Valid to 2 decimal places. **Note:** Pitch is not needed for proportional spaced fonts.
ESC(s#V (primary) ESC)s#V (secondary) # = height in points (.25 to 999.75) Default = 12	**Height (Select Point Size)** Sets the font height in points. Valid to 2 decimal places. **Note:** Point size is not needed for monospaced fonts. For fonts larger than 12 points, it may be necessary to change the line spacing.
ESC(s#S (primary) ESC)s#S (secondary) 0 Upright (Default) 1 Italic 4 Condensed 5 Condensed Italic 8 Compressed 24 Expanded 32 Outline 64 Inline 128 Shadowed 160 Outline Shadowed	**Select Style** Identifies the physical traits of a character and the composition of the font symbols. **Note:** You can only use this command to select fonts currently available in the printer. It cannot alter the appearance of the available fonts.

Table 1-8: Font Selection (continued)

Command / Parameters	Function / Result
ESC(s#B (primary) ESC)s#B (secondary) -7 Ultra Thin -6 Extra Thin -5 Thin -4 Extra Light -3 Light -2 Demi Light -1 Semi Light 0 Medium (Default) 1 Semi Bold 2 Demi Bold 3 Bold 4 Extra Bold 5 Black 6 Extra Black 7 Ultra Black	**Select Stroke Weight** Selects a font with a particular thickness. **Note:** This command will not alter the stroke weight of an available font. See Table1 in this section "Forward and Backward Compatibility Font Selection Commands" for the stroke weight variations available for the resident fonts.
ESC(s#T (primary) ESC)s#T (secondary) # Typeface identifier (0 - 65535) **Note:** For a list of typeface numbers, see Table 1 in this section: "Forward and Backward Compatibility Font Selection Commands." See "Font and Symbol Set Support" on page 4.	**Select Typeface** Selects the best fit font design.
ESC(#X (primary) ESC)#X (secondary) # = Font ID (0 - 32767)	**Select Font by Font ID** Selects the font by the identification number.
ESC(3@ (primary) ESC)3@ (secondary)	**Select Default Font** Sets all font selection characteristics to the Default Font.
ESC&p#X[data] # = number of data of bytes to print as text	**Transparent Print Data** This command is only supported when used to enter data to be encoded in a Maxicode barcode.
ESC&d#D 0,1 Fixed 2 Fixed - double 3 Floating 4 Floating - double	**Select Underline Type (Enable)** **Notes:** • Fixed underline is drawn 5 pels below cursor position. • Floating underline position is determined by all the positions of the characters with descenders in the fonts that are to be underlined. • Underline thickness is 1/100 inch. Double underline is not supported and will be printed as a single underline.
ESC&d@	**Underline - Disable**

Table 1-8: Font Selection (continued)

Command / Parameters	Function / Result
ESC&t#P 0, 1 1 byte characters 21 1 or 2 byte characters 31 1 or 2 byte characters 38 1 or 2 byte characters 1008 1, 2, or 3 byte characters (UTF-8)	**Text Parsing Method** Communicates to the PCL parser whether character codes are interpreted as 1-byte or 2-byte character codes. This command is parsed and ignored.
ESC&k#S 0 10.00 cpi 2 16.66 cpi 4 12.00 cpi	**Select Primary and Secondary Pitch** Selects the pitch for the primary and secondary font.

Table 1-9: User-Defined Symbol Set

Command / Parameters	Function / Result
ESC*c#R # = Symbol Set ID (0 - 32767) Default = 0	**Symbol Set ID Code** Sets the symbol set identification for the symbol set downloaded.
ESC(f#W[data] # = number of data bytes	**Define Symbol Set** Contains the data for the user-defined symbol sets.
ESC*c#S 0 Delete all (temporary and permanent) 1 Delete all temporary 2 Delete current (ID) 4 Make current temporary 5 Make current permanent	**Symbol Set Control** Manages user-defined symbol sets.

Table 1-10: Font Creation

Command / Parameters	Function / Result
ESC*c#D # = Font ID # (0 - 32767) Default = 0	**Set Font ID** Sets the identification number for the font being downloaded.
ESC)s#W[data] # = number of data bytes	**Load Font Header** Downloads soft font header information. **Note:** Set Font ID before using this command.
ESC*c#F 0 Delete all (temporary and permanent) 1 Delete all temporary 2 Delete previous font ID 3 Delete previous specified character 4 Make previous font ID temporary 5 Make previous font ID permanent 6 Copy current font	**Font Control** Manages soft fonts.
ESC*c#E # = Code Point (0 - 65536) Default = 0	**Set Character Code** Sets the decimal code point associated with the next character downloaded or deleted.
ESC(s#W[data] # = number of data bytes	**Load Character** Downloads character descriptor and data to the current character code.

Table 1-11: Macros

Command / Parameters	Function / Result
ESC&f#Y # = Macro ID (0 - 32767) Default = 0	**Set Macro ID** Sets the ID for the macro you have created on flash.
ESC&f#X 0 Start definition 1 End definition 2 Execute macro (previous macro ID) 3 Call macro (previous macro ID) 4 Enable overlay (previous macro ID) 5 Disable overlay 6 Delete all macros 7 Delete all temporary macros 8 Delete current macro ID 9 Make last ID temporary 10 Make last ID permanent	**Macro Control** Manages use of macros. **Notes:** • GL/2 commands are supported inside macros. • Only call and execute macro commands are allowed within a macro. • A macro may call or execu • • e another macro. This is called nesting. A maximum of two nesting levels are allowed, for a total of three levels. See “Macros” later in this section for additional information.

Table 1-12: Print Model

Command / Parameters	Function / Result
ESC*c#G **Gray Scale Fills** 0 White (default) 1-2 2% gray 3-10 10% gray 11-20 15% gray 21-35 30% gray 36-55 45% gray 56-80 70% gray 81-99 90% gray 100 100% gray (Black) **Cross-Hatch Fills** 1 Horizontal line 2 Vertical line 3 Diagonal line 4 Diagonal line 5 Square grid 6 Diagonal grid **User-Defined Patterns** # = User-Defined Pattern ID	**Area Fill ID** Selects pattern used to fill a rectangular area. **Note:** This command is also used to set the user-defined pattern ID. Cross-Hatch Fills are not supported.
ESC*v#N 0 Transparent (Default) 1 Opaque	**Source Transparency Mode** Affects copying of white pixels from the source onto the destination image.
ESC*v#O 0 Transparent (Default) 1 Opaque	**Pattern Transparency Mode** Affects copying of white pixels from the pattern onto the destination image.
ESC*l#O	**Logical Operation** This command is parsed and ignored.
ESC*l#R	**Pixel Placement** This command is parsed and ignored.
ESC*v#T 0 Solid Black (Default) 1 Solid White 2 Gray Shading Pattern 3 Cross-Hatch Pattern 4 User Defined Pattern 9 True gray Level Fill	**Select Current Pattern** Selects pattern used when printing text and raster images. **Note:** Cross-Hatch Patterns are not supported.

Table 1-13: User-Defined Pattern

Command / Parameters	Function / Result
ESC*c#W[data] # = number of data bytes	**User-Defined Pattern** Downloads binary pattern data.
ESC*p#R 0 Rotate with print (Default) 1 Fixed	**Set Pattern Reference Point** Sets the pattern reference point to the current cursor position for user-defined patterns. **Note:** Default pattern reference point is the upper left corner of the logical page.
ESC*c#Q 0 Delete all patterns (temporary and permanent) 1 Delete all temporary patterns 2 Delete pattern (last ID specified) 4 Make pattern of last ID # temporary 5 Make pattern of last ID # permanent	**Caution: Pattern Control** Manages the use of user-defined patterns. **Note:** Use the Area Fill ID command (ESC*c#G) to set the ID.

Table 1-14: Rectangular Area Fill Graphics

Command / Parameters	Function / Result
ESC*c#H # = Number of Decipoints (0 - 32767) (1 Decipoint = 1/720 inch) Default = 0, valid to 4 decimal places	**Horizontal Rectangle Size (in Decipoints)** Specifies the rectangle width in decipoints.
ESC*c#A # = Number of PCL Units (0 - 32767) Default = 0	**Horizontal Rectangle Size (in PCL Units)** Specifies the rectangle width in PCL units. **Note:** The size of PCL Units is set by the Unit-of-Measure command.
ESC*c#V # = Number of Decipoints (0 - 32767) (1 Decipoint = 1/720 inch) Default = 0, valid to 4 decimal places	**Vertical Rectangle Size (in Decipoints)** Specifies the rectangle height in decipoints.
ESC*c#B # = Number of PCL Units (0 - 32767) Default = 0	**Vertical Rectangle Size (in PCL Units)** Specifies the rectangle height in PCL units. **Note:** The size of PCL Units is set by the Unit-of-Measure command.

Table 1-14: Rectangular Area Fill Graphics (continued)

Command / Parameters	Function / Result
ESC*c#G **Gray Scale Fills** 0 White (default) 1-2 2% Gray 3-10 10% Gray 11-20 15% Gray 21-35 30% Gray 36-55 45% Gray 56-80 70% Gray 81-99 90% Gray 100 100% Gray (Black) **Cross-Hatch Fills** 1 Horizontal Line 2 Vertical Line 3 Diagonal Line 4 Diagonal Line 5 Square Grid 6 Diagonal Grid **User-Defined Patterns** # = User-Defined Pattern ID	**Area Fill ID** Selects the pattern used to fill the rectangular area. **Note:** This command is also used to set the user-defined pattern ID. Cross-Hatch Patterns are not supported
ESC*c#P 0 Black Fill (Default) 1 White Fill 2 Gray Fill 3 Pre-Defined Cross-Hatch Pattern Fill 4 User-Defined Pattern 5 Current Pattern Fill 9 True gray Level Fill	**Fill Rectangular Area** Fills a rectangular area defined by Horizontal and Vertical Rectangle Sizes with the selected pattern. **Note:** Cross-Hatch Patterns are not supported.

Table 1-15: Raster Graphics

Command / Parameters	Function / Result
ESC*t#R 300 300 dpi	**Raster Resolution** **Note:** Only 300 dpi is supported. All other values are parsed and ignored.
ESC*r#F 0 Rotate with print 3 Fixed (Default)	**Raster Graphics Presentation** Sets the Raster Image Orientation in relation to the logical page.
ESC*r#S # = Number of Input Pixels	**Raster Width (Source)** Sets the width of the clip window for raster graphics.
ESC*r#T # = Number of Raster Lines	**Raster Height (Source)** Sets the height of the clip window for raster graphics.
ESC*r#A 0 Left Graphics Margin at 0 (Default) 1 Current Cursor Position 2 At logical left page limit with scaling On 3 At current cursor position with scaling On	**Start Raster Graphics** Sets the left margin for raster graphics.
ESC*b#V[data] # = Number of Data Bytes	**Transfer Raster Data by Plane** This command is used when the raster data is encoded by plane as specified by the Simple Color command or the Configure Image Data command. The command sends each plane in the row except the last.
ESC*b#Y # = Number of Raster Lines	**Y Offset** Moves the cursor position down by the specified number of raster lines.
ESC*b#M 0 Uncoded (Default) 1 Run-Length Encoded 2 Tagged Image File Format (TIFF) byte 3 Delta Row 5 Adaptive Compression 9 Replacement Delta Row 999 Zlib 1002 Group 4 1003 Group 3 one dimensional 1004 Group 3 two dimensional K=2 1005 Group 3 two dimensional K=4 1006 TIFF word (16 bit) 1007 TIFF double-word (32 bit) 1008 Adaptive compression (includes TIFF word and TIFF double-word)	**Set Raster Compression Mode** Identifies the compression mode the host uses to transfer RIG data. For instance, this command can be run-length encoding or TIFF encoding. **Note:** For further information, see “Raster Compression Mode” in this section, and “Group 3 and Group 4 Raster Compression” in this section.
ESC*b#W[data] # = Number of Data Bytes	**Transfer Raster Data by Row/Block** Transfers RIG data. **Note:** After each command, the cursor position is moved to the beginning of the next raster row.

Table 1-15: Raster Graphics (continued)

Command / Parameters	Function / Result
ESC*rB	**End Raster Graphics (Version B)** Signals the end of the raster graphics transfer. If a Raster Height is specified, the cursor is moved to the first raster row past the Raster Height.
ESC*rC	**End Raster Graphics (Version C)** Same as Version B, but: • Resets the compression mode to uncoded. • Sets the left graphics margin to 0.
ESC*t#H	**Raster Width (Destination)** Sets the width of the destination raster.

Table 1-15: Raster Graphics (continued)

Command / Parameters	Function / Result
ESC*t#V	**Raster Height (Destination)** Sets the height of the destination raster.
ESC*g#W[data] # - 8 (K-only) or 26 (KCMY) **Data** Byte 0 - 0x02 (constant) Byte 1 - number of colors 0x01 - K only 0x04 - CMYK Byte 2,3 - X res for K plane 0x012C (300) or 0x0258 (600) Byte 4,5 - Y res for K plane 0x012C (300) or 0x0258 (600) Byte 6,7 - K plane intensity levels 0x02 (1 bit/plane) or 0x04 (2 bits/plane) Byte 8,9 - X res for C plane 0x012C (300) or 0x0258 (600) Byte 10,11 - Y res for C plane 0x012C (300) or 0x0258 (600) Byte 12,13 - C plane intensity levels 0x02 (1 bit/plane) or 0x04 (2 bits/plane) Byte 14,15 - X res for M plane 0x012C (300) or 0x0258 (600) Byte 16,17 - Y res for M plane 0x012C (300) or 0x0258 (600) Byte 18,19 - M plane intensity levels 0x02 (1 bit/plane) or 0x04 (2 bits/plane) Byte 20,21 - X res for Y plane 0x012C (300) or 0x0258 (600) Byte 22,23 - Y res for Y plane 0x012C (300) or 0x0258 (600) Byte 24,25 - Y plane intensity levels 0x02 (1 bit/plane) or 0x04 (2 bits/plane)	**Set Raster Configuration** Sets the configuration of the destination raster.

Table 1-16: Status Readback

Command / Parameters	Function / Result
ESC*s#T 0 Invalid location (Default) 1 Use currently selected location 2 All locations 3 Internal (resident) 4 Downloaded entity 5 Cartridge 7 User-installable flash 200 Disk	**Set Status Readback Location Type** Sets the status location type to the specified value. The 5 value for Cartridge may be specified, but since your printer does not support font cards or cartridges, the command is ignored. The 7 value for User-installable flash is only valid when flash memory is installed. The 200 value is only valid when a hard disk is installed.
ESC*s#U 0 All 1 If download, temporary; otherwise, highest priority 2 If download, permanent; otherwise, next higher priority	**Set Status Readback Location Unit** Sets the status location unit to the specified value. The location unit is used along with the location type to identify a location for the Inquire Status Readback Entity command. **Note:** The unit value is interpreted differently, depending on the location type specified.
ESC*s#I 0 Font 1 Macro 2 User-defined pattern 3 Symbol set (for unbound scalable fonts) 4 Font extended	**Inquire Status Readback Entity** Returns the requested information set by Set Status Readback Location Type and Set Status Readback Location Unit.
ESC*s1M	**Free Space** Returns the total available memory and the largest available block of memory.
ESC&r#F 0 Flush all complete pages 1 Flush all pages	**Flush All Pages** Holds print jobs in the print buffer until the current job finishes printing.
ESC*s#X -32767 to 32767 Default = 0	**Echo** Returns # back to host computer.

Table 1-17: Picture Frame

Command / Parameters	Function / Result
ESC*c#X # of Decipoints: 0 to 32767 (1 Decipoint = 1/720 inch)	**Picture Frame Horizontal Size (in Decipoints)** Specifies the horizontal dimension of the picture frame used when printing a GL/2 plot.
ESC*c#Y # of Decipoints: 0 to 32767 (1 Decipoint = 1/720 inch)	**Picture Frame Vertical Size (in Decipoints)** Specifies the vertical dimension of the picture frame used when printing a GL/2 plot.
ESC*c0T 0 Set Anchor Point to Cursor Position	**Set Picture Frame Anchor Point** Sets the position of the picture frame anchor point to the cursor position. The picture frame anchor point defines the location of the upper left corner of the picture frame.
ESC*c#K Size in inches: 0 to 32767	**GL/2 Horizontal Plot Size** Specifies the horizontal scaling factor used when importing an image into the picture frame.
ESC*c#L Size in inches: 0 to 32767	**GL/2 Vertical Plot Size** Specifies the vertical scaling factor used when importing an image into the picture frame.
ESC%#B 0 Use Previous GL/2 Pen Position 1 Use Current PCL Cursor Position	**Enter GL/2 Language** Exits PCL emulation and uses GL/2 commands to print.
ESC%#A 0 Use Previous PCL Cursor Position 1 Use Current GL/2 Pen Position	**Enter PCL Emulation** Exits GL/2 mode and uses PCL emulation commands to print.

Table 1-18: Miscellaneous Commands

Command / Parameters	Function / Result
ESC&s#C	**End-Of-Line Text Wrap** This command is parsed and ignored.
ESCY	**Display Functions On** This command is parsed and ignored.
ESCZ	**Display Functions Off** This command is parsed and ignored.
ESCz	**Print Test Page** This command is parsed and ignored.

Table 1-18: Miscellaneous Commands (continued)

Command / Parameters	Function / Result
ESC*o#M(b)	**Print Quality** This command is parsed and ignored.
ESC&ℓ#M(b)	**Paper Type** This command is parsed and ignored.

GL/2 COMMANDS

Note: GL/2 is not a stand-alone plotter emulation. It can only be entered from within PCL emulation and cannot be used with software without a unique printer driver written explicitly for GL/2.

Table 1-19: Configuration Group

Escape Sequence	Function	Support
CO	GL/2: Comment	
DF	GL/2: Default Values	
IN	GL/2: Initialize	
IP	GL/2: Input P1 and P2	
IR	GL/2: Input Relative P1 and P2	
IW	GL/2: Input Window	Limited
RO	GL/2: Rotate Coordinate System	
SC	GL/2: Scale	Limited

Table 1-20: Vector Group

Escape Sequence	Function	Support
AA	GL/2: Arc Absolute	Not supported
AR	GL/2: Arc Relative	Not supported
AT	GL/2: Absolute Arc Three Point	Not supported
BR	GL/2: Bezier Relative	Not supported
BZ	GL/2: Bezier Absolute	Not supported
CI	GL/2: Circle	Limited
PA	GL/2: Plot Absolute	
PC	GL/2: Pen Color	Not supported
PD	GL/2: Pen Down	Limited
PE	GL/2: Polyline Encoded	Not supported
PR	GL/2: Plot Relative	
PU	GL/2: Pen Up	Limited
RT	GL/2: Arc Relative Three Point	Not supported

Table 1-21: Polygon Group

Escape Sequence	Function	Support
EA	GL/2: Edge Rectangle Absolute	Limited
EP	GL/2: Edge Polygon	Not supported
ER	GL/2: Edge Rectangle Relative	Limited
EW	GL/2: Edge Wedge	Not supported
FP	GL/2: Fill Polygon	Not supported
PM	GL/2: Polygon Mode	Not supported
RA	GL/2: Fill Rectangle Absolute	Limited
RR	GL/2: Fill Rectangle Relative	Limited
WG	GL/2: Fill Wedge	Not supported

Table 1-22: Character Group

Escape Sequence	Function	Support
AD	GL/2: Alternate Font Definition	Not supported
CF	GL/2: Character Fill Mode	Not supported
CP	GL/2: Character Plot	Not supported
DI	GL/2: Absolute Direction	Limited—only right angles supported (DI1,0, DI0, 1, DI-1, 0, and DI0,-1
DR	GL/2: Relative Direction	Not supported
DT	GL/2: Define Label Terminator	
DV	GL/2: Define Variable Text Path	Limited—only left to right (DV0) and right to left (DV2) supported
ES	GL/2: Extra Space	
FI	GL/2: Primary Font	Not supported
FN	GL/2: Secondary Font	Not supported
LB	GL/2: Label	
LO	GL/2: Label Origin	Limited—only end points 1, 3, and 7 supported
SA	GL/2: Select Alternate Font	Not supported
SB	GL/2: Scalable or Bitmap Fonts	Not supported
SD	GL/2: Define Standard Font	
SI	GL/2: Absolute Character Size	Not supported
SL	GL/2: Character Slant	Not supported
SR	GL/2: Relative Character Size	Not supported

Table 1-22: Character Group (continued)

Escape Sequence	Function	Support
SS	GL/2: Select Standard Font	
TD	GL/2: Transparent Data	Not supported

Table 1-23: Line and Fill Attributes Group

Escape Sequence	Function	Support
AC	GL/2: Anchor Corner	
FT	GL/2: Fill Type	Not supported
LA	GL/2: Line Attributes	Not supported
LT	GL/2: Line Type	Not supported
PW	GL/2: Pen Width	Limited
RF	GL/2: Raster Fill Definition	Not supported
SM	GL/2: Symbol Mode	Limited
SP	GL/2: Select Pen	Limited
SV	GL/2: Screened Vectors	Not supported
TR	GL/2: Transparency Mode	Not supported
UL	GL/2: User-Defined Line Type	Not supported
WU	GL/2: Pen Width Unit Selection	Limited

Table 1-24: Miscellaneous Group

Command / Parameter	Command Name	Support
CR	GL/2: Color Range	Not supported
LM	GL/2: Language Model	Not supported
MC	GL/2: Logical Operation	Not supported
NP	GL/2: Number of Pens	Not supported
PP	GL/2: Pixel Placement	Not supported
TM	GL/2: Threshold Matrix	Not supported

RASTER IMAGE GRAPHICS

These commands utilize the raster area. Before sending data, set the presentation mode, the resolution, the compression mode, the raster height and width, and start raster graphics. These parameters are in effect until you overwrite them with a different command or there is a printer reset. To ensure that the printed image appears in the expected area, set width and height parameters.

RASTER COMPRESSION MODE

The Raster Compression Mode command determines how raster data is coded. It affects the amount of code required to create an image, and the efficiency of image printing.

Syntax:

ESC*b#M

Parameters:

0	Uncoded (default)
1	Run-Length Encoded
2	Tagged Image File Format (TIFF) Byte
3	Delta
5	Adaptive Compression
9	Replacement Delta Row
999	Zlib
1002	Group 4
1003	Group 3 one dimensional
1004	Group 3 two dimensional K=2
1005	Group 3 two dimensional K=4
1006	TIFF word (16 bit)
1007	TIFF double-word (32 bit)
1008	Adaptive Compression (includes TIFF word and TIFF double-word)

Descriptions and examples of the different parameters appear on the following pages. Each example draws the same square outline 64 bits (8 bytes) wide by 64 scan lines long.

UNCODED DATA

Uncoded Data is not compressed. Only those bytes needed to form the image are sent. Each bit represents a single dot. In the first byte, bit 7 corresponds to the first dot in the raster row, bit 5 to the third dot, and so forth.

Example:

ESC*p300x300Y	|Move the cursor to 1" x 1" (1 in. from top margin and 1 in. from left edge of logical page)
ESC*t100R	|Set resolution to 100 dots per inch
ESC*r0F	|Rotate image to match current orientation
ESC*b0M	|Set compression mode to Uncoded
ESC*r1A	|Start raster graphics at current position
ESC*b8W 'FF FF FF FF FF FF FF FF'x	|Raster data uncompressed
ESC*b8W '80 00 00 00 00 00 00 01'x	
ESC*b8W '80 00 00 00 00 00 00 01'x	
…	|Repeat to provide 64 total scan lines
ESC*b8W '80 00 00 00 00 00 00 01'x	
ESC*b8W 'FF FF FF FF FF FF FF FF'x	
ESC*rB	|End graphics

RUN-LENGTH ENCODED DATA

Run-Length Encoded Data is interpreted in pairs of bytes. The first byte:

- Acts as a counter, or control byte.
- Indicates how many times to repeat the data in the second byte.
- Can be from 0 (no repetition) to 255.
- The second byte is the data byte.

Example:

ESC*p300x600Y	|Move cursor to 1" x 2"
ESC*b1M	|Set compression to Run-Length
ESC*r1A	|Start raster graphics at current position
ESC*b2W '07FF'x	|Run-Length: 8x'FF'x
ESC*b6W '0080 0500 0001'x	|1x'80'x, 6x'00'x, 1x'01'x
ESC*b6W '0080 0500 0001'x	|1x'80'x, 6x'00'x, 1x'01'x
…	|...
ESC*b6W '0080 0500 0001'x	|1x'80'x, 6x'00'x, 1x'01'x
ESC*b2W '07FF'x	|8x'FF'x
ESC*rB	|End graphics

TAGGED IMAGE FILE FORMAT

TIFF “Packbits” contain a control byte (a signed number) that indicates whether the raster data bytes are to be repeated (up to 127 times) or printed as encoded data.

- For control values of 0 through 127, the next (Control+1) byte(s) uncoded.
- For control values of -1 through -127 (FF’x - ‘81’x), the next byte is repeated (Abs(Control)+1) times.

Example:

ESC*p300x900Y	|Move cursor to 1" x 3"
ESC*b2M	|Set compression to TIFF
ESC*r1A	|Start Raster Graphics at current position
ESC*b2W 'F9FF'x	| TIFF: 8x'FF'x
ESC*b6W '0080 FB00 0001'x	|1:'80'x, 6x'00'x, 1: '01'x or
ESC*b9W '0780000000000000001'x	|8: '8000000000000001'x
…	|…
ESC*b6W '0080 FB00 0001'x	|1:'80'x, 6x'00'x, 1: '01'x
ESC*b2W 'F9FF'x	|8x'FF'x
ESC*rB	|End graphics

DELTA ROW

Delta Row is a compression mode that identifies and transmits only those bytes different from the ones in a preceding row. The control byte consists of two parts:

- High 3 bits: Number of bytes to replace +1 (1 to 8).
- Low 5 bits: Offset from last unmodified byte (0-30); if the offset is 31, the next byte(s) is added to the offset until the next byte is not 255.

Example:

ESC*p300x1200Y	|Move cursor to 1" x 4"
ESC*b3M	|Set compression to Delta Row
ESC*r1A	|Start raster graphics at current position
	|Num Offset
ESC*b9W 'E0FFFFFFFFFFFFFFFF'x	|'111 00000'b=8 at 0: 'FFFFFFFFFFFFFFFF'x
ESC*b9W 'E08000000000000001'x	|8 at 0: '8000000000000001'x
ESC*b0W	|No bytes change
…	
ESC*b0W	|No bytes change
ESC*b9W 'E0FFFFFFFFFFFFFFFF'x	|8 at 0: '8FFFFFFFFFFFFFF'x
ESC*rB	|End graphics

ADAPTIVE COMPRESSION

Adaptive compression allows the combined use of compression methods 0 through 3 (Uncoded, Run-Length Encoded, TIFF, and Delta Row). It also allows the printing of empty rows (all zeros) or duplicate rows.

- The Transfer Raster Data command size includes all rows (scan lines).
- Scan Mode and SizeH,L are three-byte primary control strings: CountH and CountL.

Table 1-25: Adaptive Compression Control Strings

Scan Mode	CountH,CountL	Data
0	Data sizeH,L	Uncoded raster scan data
1	Data sizeH,L	Size of Run-length encoded data (high,low)
2	Data sizeH,L	Size of Tagged Image File Format (TIFF) data (high,low)
3	Data SizeH,L	Size of Delta Row data (high,low)
4	NumberH,L of empty rows	None
5	NumberH,L of duplicate rows	None
254	Data SizeH,L	TIFF word
255	Data SizeH,L	TIFF double-word

Example:

```
ESC*p300x1500Y                          |Move cursor to 1" x 5"
ESC*b5M                                 |Set the compression to Adaptive
                                          Compression
ESC*b29W                                |Raster Data: 29 bytes follow
  '03 0009'x 'E0FFFFFFFFFFFFFFFF'x      |Delta Row: 8 at 0:
                                          'FFFFFFFFFFFFFFFFh'x
  '01 0006'x '0080 FB00 0001'x          |Run Length: 1:'80'x, 6x'00'x, 1:'01'x
  '05 0035'x                            |Duplicate rows: 61 times'02 0002'x
  'F9FF 'x                              |TIFF: 8x'FF'x
ESC*rB                                  |End graphics
```

ZLIB

Zlib is a generic compression method. It refers to a standard for compression as well as the library that implements the standard.

The zlib compression method uses the deflate algorithm. This same algorithm is used by more widely known compression utilities such as PKZIP and GZIP.

Compressed data is a series of variably-sized blocks. An encoder determines how to break the data into blocks and finds the best compression method to use for each block.

An encoder works based on the following principles. The encoder creates a dictionary containing different characters in a set of data. Short strings of bits represent more commonly occurring characters, and long strings of bits represent less frequently used characters. A probability tree determines which characters are frequently used. Repeated patterns in a string of characters are identified and stored, so the string doesn't have to be stored multiple times.

A three-bit zlib header is added to the beginning of a block to describe the type of compression used and indicates whether the block is a final block. Other information in the header includes checksums, compression algorithm used, and the level of compression. In compression all checksums are set to zero and in decompression the checksums are ignored.

The memory required for zlib compression and decompression is independent of the size of the data to be compressed or decompressed.

The number 999 does not conflict with other compression types, so it is used to represent zlib compression. See "Raster Compression Mode" in this section for more information.

GROUP 3 AND GROUP 4 RASTER COMPRESSION

Since Group 4 images do not use line endings, the width of the image must be specified using the Raster Width command (ESC*r#S).

The compressed image data is sent to the printer using the Transfer Raster Data command (ESC*b#W). The maximum number of bytes that can be sent using the Transfer Raster Data command is 32K bytes. Images larger than 32K bytes must be broken up and sent using multiple commands. It does not matter where the image is broken, or how many Transfer Raster Data commands are used. Once the image is started (with a Transfer Raster Data command), no other commands are allowed until the entire image has been sent.

The following example prints a Group 4 image file that is 256 bits wide and 9,645 bytes long:

ESC*b1002M	|Set Raster Compression to Group 4
ESC*r256S	|Define width of image in input bits
ESC*r1A	|Start Raster Graphics at current position
ESC*b9645W	|9,645 bytes of a Group 4 image
…[*Group 4 image data*]…	
ESC*rB	|End Raster Graphics

All lines of data must be the same length. If they are not, zeroes (0) must be added to attain the same length.

Note: If the uncompressed image extends beyond the logical page dimensions or beyond the raster width specified in the Raster Width command (ESC*r#S), the image is clipped at print time.

MACROS

When creating a macro, first assign it an ID number. If this number is identical to an existing macro ID in RAM, the old macro is deleted when you specify the Macro Control Start Definition. Next, start the macro definition, send the contents of the macro, and stop the macro definition.

Note: Although a macro may be called or executed from within another macro (nesting), a macro cannot be defined within another macro definition. Each macro must be defined separately.

Example:

This example creates a macro to print the Wigit Corp. logo, then calls the logo macro in the body of a letter.

ESC&f1Y	|Set the macro ID to 1
ESC&f0X	|Start the macro definition
ESC&a+72H	|Relative move right 1/10 inch (+72/720th)
ESC(8U	|Select Roman-8 symbol set
ESC(s1p18v0s3b4101T	|Select CG Times 18 point bold
W	|Print W
ESC&a-21.6H	|Relative move left 0.03 inch
ESC(s12v1S	|Select (CG Times) 12 point (bold)
italic	
igit	|Print igit
ESC&a+72H	|Relative move right 1/10 inch
ESC(s18v0S	|Select 18 point and turn off italic
C	|Print C
ESC(s12v1S	|Select 12 point italic
orp.	|Print orp.
ESC&a+72H	|Relative move right 1/10 inch
ESC&f1X	|End of macro definition
ESC&f10X	|Make Macro ID 1 permanent
…	
…	
From:	|Print the header From:
ESC&f1y3X	|Set the macro ID to 1 and call the macro
…	|Print the letter
Thank you for …	|Print the closing
ESC&f1y3X	|Set the macro ID to 1 and call the macro
…	

2

PRINTER JOB LANGUAGE

- **PJL Command Notation**
- **Kernel Commands**
- **Job Separation Commands**
- **Environment Commands and Variables**
- **Status Readback Commands**
- **Status Message Format**

PRINTER JOB LANGUAGE

Your printer supports complete Printer Job Language (PJL) commands, including certain commands that cause the printer to enter PCL emulation.

To determine which commands your printer supports, see Section, “PCL Support.”

PJL COMMAND NOTATION

The syntax for each supported PJL command is listed in this chapter. The following character codes are used throughout the chapter to illustrate the syntax of each PJL command.

Table 2-1: PJL Command Notation

Character Code	Description	Hex Code	Decimal Code
<ESC>	Escape Character	0x1B	27
<LF>	Line Feed Character	0x0A	10
<CR>	Carriage Return Character	0x0D	13
<FF>	Form Feed Character	0x0C	12
<HT>	Horizontal Tab	0x09	9
<UEL>	Universal Exit Language	0x1B 25 2D 31 32 33 34 35 58	

Note:

- Parameters enclosed in square brackets ([ ]) are optional and not required for command execution.
- The PJL interpreter requires uppercase for the @PJL prefix for all PJL commands except the Universal Exit Language (UEL) command. The rest of the PJL command is not case sensitive. The UEL command is case sensitive.
- All PJL commands except UEL must be terminated with a line feed character (<LF>).

KERNEL COMMANDS

UNIVERSAL EXIT LANGUAGE Command

The Universal Exit Language (UEL) command terminates the current printer language and allows dynamic switching into PJL.

Syntax:

<ESC>%-12345X

Notes:

The PJL commands must immediately follow the UEL command (that is, the X in the UEL syntax must be immediately followed by the @PJL of the next PJL command).

ENTER LANGUAGE Command

This command causes the printer to enter PCL emulation.

Syntax:

@PJL ENTER LANGUAGE = pcl[<CR>]<LF>

Note: You can use uppercase, lowercase, or mixed case. (@PJL must be uppercase; all others can be mixed or lowercase.)

COMMENT Command

This command lets you add descriptive comments to your PJL job.

Syntax:

@PJL COMMENT ***words***[<CR>]<LF>

Notes:

- When the printer receives this command, it is ignored.
- The ***words*** parameter can be any combination of printable characters, spaces, and horizontal tabs.
- The COMMENT command is terminated by the line feed character (<LF>).

JOB SEPARATION COMMANDS

You printer supports the PJL JOB and EOJ commands.

JOB Command

The host computer can use the JOB command to separate print data into various parts or jobs. Specifically, the JOB command signifies to the printer the start of a print job. Use the EOJ command to signify the end of a job. In addition, use the JOB/EOJ pair to accomplish the following:

- Provide a job name.
- Indicate which pages of the job should be printed.
- Monitor the job status as it prints.

Syntax:

@PJL JOB [NAME = "***job name***"] [START = ***first page***]
[END = ***last page***] [PASSWORD = ***number***][<CR>]<LF>

Notes:

- The JOB command should only be used in conjunction with the EOJ command.
- After receiving a JOB command, the printer does not process a UEL command as a PJL job boundary until it receives the corresponding EOJ. Instead, UELs occurring within a JOB/EOJ pair are processed as printer language resets (for example, PCL ^{ESC}E).

Parameters:

NAME = "***job name***"

Use the NAME parameter to assign a character string name to a particular job. The name may be any combination of printable characters, spaces or horizontal tabs up to a maximum of 80 characters, spaces, or tabs. The ***job name*** must be enclosed in double quotes, as indicated by the command syntax.

START = ***first page***

Use the START parameter in conjunction with the END parameter to skip the printing of a particular portion of the job. The emulator discards pages of a job until the page specified by this parameter is reached. The ***first page*** range is from 1 to 2,147,483,647. Omission of the START parameter causes the printer to start printing with page 1 of the job.

END = ***last page***

Use the END parameter in conjunction with the START parameter to skip the printing of a particular portion of the job. The emulator discards all pages of a job after the ***last page*** has been printed. The specification of ***last page*** is relative to page 1 of the print job and its range is from 1 to 2,147,483,647. Omission of the END parameter causes the printer to print all pages to the end of the job.

EOJ Command

The EOJ command signifies the end of a print job.

Syntax:

@PJL EOJ [NAME = "***job name***"][<CR>]<LF>

Note:

Only use the EOJ command in conjunction with the JOB command.

Parameter:

NAME = "***job name***"

Use the NAME parameter to assign a character string name to a particular job. The name may be any combination of printable characters, spaces, or horizontal tabs up to a maximum of 80 characters, spaces, or tabs. The NAME string may be different from the NAME string specified in the JOB command. The ***job name*** must be enclosed in double quotes.

ENVIRONMENT COMMANDS AND VARIABLES

This section describes the printer environment variables and the PJL commands used to modify or query the variables.

The following commands modify the environment variables, and are described in this section:

- DEFAULT
- SET
- INITIALIZE
- RESET

The following commands query the environment variables, and are described in “Status Readback Commands” on page 2-12.

- INQUIRE
- DINQUIRE
- INFO
- ECHO

DEFAULT Command

This command modifies the default setting for the specified environment variable and stores the setting in the printer NVRAM. The new setting is activated with the occurrence of the next PJL reset condition.

Syntax:

@PJL DEFAULT [command modifier:***value***] variable=***value***[<CR>]<LF>

[command modifier:***value***]

The [command modifier:***value***] parameter specifies the type of PJL variables to be modified. The variables supported are listed in “Table 2-2: PJL Variables” on page 2-10.

variable=***value***

The supported variables and values are listed in “Table 2-2: PJL Variables” on page 2-10.

Note: Variables may be modified by the DEFAULT command, except those marked Read Only. Some variables may only be modified using the PJL SET command. These variables cannot be modified using the DEFAULT command. They are marked Set Only.

SET Command

This command modifies the current setting for the specified environment variable. The new setting is active immediately, and remains active until the next occurrence of a PJL reset condition.

Use the SET command to modify any currently defined environment variable that cannot be set using the desired printer language. For example, use the PJL SET command to set Page Protect, which cannot be set within a printer language such as PCL emulation.

Syntax:

@PJL SET [command modifier:***value***] variable=***value***[<CR>]<LF>

where

[command modifier:***value***]

The [command modifier:***value***] parameter specifies the type of PJL variables to be modified. The variables supported are listed in "Table 2-2: PJL Variables" on page 2-10.

variable=***value***

The supported variables and values are listed in "Table 2-2: PJL Variables" on page 2-10.

Note: Variables may be modified by the DEFAULT command, except those marked Read Only. Some variables may only be modified using the PJL SET command. These variables cannot be modified using the DEFAULT command. They are marked Set Only.

INITIALIZE Command

This command restores both the current and default environment variables to their factory default values and updates the printer NVRAM. This command affects all of the variables listed in "Table 2-2: PJL Variables" on page 2-10, except all read-only variables.

Syntax:

@PJL INITIALIZE[<CR>]<LF>

RESET Command

This command resets the current environment variables to the settings stored in the printer NVRAM. Therefore, any variables modified by the PJL SET command are returned to their default value after execution of the PJL RESET command.

Syntax:

@PJL RESET[<CR>]<LF>

To determine which variables your printer supports, see “Table 1: PJL Variables” in this section.

Table 2-2: PJL Variables

Variable	Function	Selections	Factory Default
COPIES	Number of copies of each page	1 to 999 **Note:** If a value greater than 999 is specified by a SET or DEFAULT command, the value is changed to 999.	1
FORMLINES	Lines per page	1 to 255 **Note:** If a value greater than 255 is specified by a SET or DEFAULT command, the value is changed to 255.	60
JOBNAME (SET only)	Print and Hold Jobname	“jobname” *jobname* is a text string truncated to 24 characters. **Note:** A null (“ ”) string is an acceptable value and indicates no Print and Hold Jobname is specified.	NULL (No jobname)
ORIENTATION	Print orientation	PORTRAIT, LANDSCAPE	PORTRAIT
RESOLUTION	Print Resolution	300	300
LAUTOCRLF	Auto CR after LF	ON, OFF	OFF
LAUTOLFCR	Auto LF after CR	ON, OFF	OFF
LBLANKPAGES	Blank Pages	DONOTPRINT, PRINT **Note:** Some printers have a fixed value of DONOTPRINT.	DONOTPRINT
LCUSTOMPAPERUNITS	Universal Units of Measure	INCHES, MILLIMETERS	INCHES
LCUSTOMPAPERWIDTH	Universal Width	3 to 36.01 in increments of 0.01 in. **Note:** Values are determined to be inches or millimeters based on the LCUSTOMPAPERUNITS setting.	216, 305 mm 8.5, 12 in. (Model and country specific)
LCUSTOMPAPERHEIGHT	Universal Height	76 to 915 in increments of 1 mm 3 to 36.01 in increments of 0.01 in.	4.2
LCUSTOMPAPERFEED	Universal Feed Direction	SHORTEDGE, LONGEDGE	SHORTEDGE

Table 2-2: PJL Variables (continued)

Variable	Function	Selections	Factory Default
FONTNUMBER	Font Number	0–17	0
FONTSOURCE	Font Source	I, S I Internal font source S Permanent download fonts	I
PITCH	Default pitch (fixed-pitch fonts)	0.08 to 100 (in increments of 0.01) **Note:** If an invalid pitch is requested, the printer selects the closest pitch.	10.00
PTSIZE	Default point size (proportional spaced fonts)	1 to 1008 (in increments of 0.25) **Note:** If an invalid point size is requested, the printer selects the closest point size.	12.00
SYMSET	Symbol set for the default font	If a symbol set is requested that is not resident in the printer, the symbol set is not changed.	PC8

STATUS READBACK COMMANDS

Applications can request configuration and status information from the printer using the Status Readback commands. In addition, the printer can also be instructed to send unsolicited status information back to the host computer when asynchronous events occur, such as a memory error or a paper jam.

To determine which commands your printer supports, see “Table 4: Status Readback Commands” in this section.

DINQUIRE Command

This command is used to query the default setting (NVRAM) of the specified environment variable.

Syntax:

@PJL DINQUIRE [command modifier:***value***] variable[<CR>]<LF>

Response Syntax:

@PJL DINQUIRE [command modifier:***value***] variable<CR><LF>
value<CR><LF>
<FF>

where:

[command modifier:***value***]

The [command modifier:***value***] parameter specifies the type of PJL variable to be queried. The variables supported are listed in “Table 2-2: PJL Variables” on page 2-10.

variable=***value***

The supported variables are listed in “Table 2-2: PJL Variables” on page 2-10.

This printer returns a ? for inquiries of an unsupported variable, or inquiries of a variable associated with an option that is not installed.

ECHO Command

The ECHO command instructs the printer to return the specified words after the command is parsed. This command provides a method of capturing the status information returned by a specific print job.

Syntax:

@PJL ECHO [***words***][<CR>]<LF>

Response Syntax:

@PJL ECHO [***words***]<CR><LF>
<FF>

words parameter

The ***words*** parameter must start with a printable character and can consist of a combination of printable characters, spaces, and horizontal tabs.

Note: The ECHO command is terminated by the line feed character.

INFO Command

The INFO command is used to query status information from the printer. Table 2-3 lists the categories of information that can be queried.

See “Status Message Format” on page 2-18 for additional information about the messages returned by the INFO STATUS, USTATUS DEVICE, and USTATUS TIMED commands.

Syntax:

@PJL INFO ***category***[<CR>]<LF>

Response Syntax:

@PJL INFO ***category***<CR><LF>
[one or more lines of printable characters, spaces, or tabs]<CR><LF>
<FF>

category

Table 2-3 lists the supported categories.

Table 2-3: INFO Category Parameter Values

Category Values	Description
ID	Returns the model name or the model number stored in the printer NVRAM.
CONFIG	Returns the printer configuration, including paper sources, paper sizes, and installed options.
MEMORY	Returns the printer available memory.
PAGECOUNT	Returns the printer page count.
STATUS	Returns the printer current status.
VARIABLES	Returns the printer environment variables and values.
USTATUS	Returns the printer unsolicited status variables and values.

INFO CONFIG Response Syntax (An Example):

```
@PJL INFO CONFIG<CR><LF>
   USTATUS [4 ENUMERATED]<CR><LF>
      DEVICE<CR><LF>
      JOB<CR><LF>
      PAGE<CR><LF>
      TIMED<CR><LF>
   MEMORY=2097152<CR><LF>
   <FF>
```

INQUIRE Command

This command is used to query the current setting of the specified environment variable.

Syntax:

@PJL INQUIRE [command modifier:***value***] variable[<CR>]<LF>

Response Syntax:

@PJL INQUIRE [command modifier:***value***] variable<CR><LF>
value<CR><LF>
<FF>

[command modifier:***value***]

The [command modifier:***value***] parameter specifies the type of PJL variables to be queried. The variables supported are listed in "Table 2-2: PJL Variables" on page 2-10.

variable=***value***

The supported variables are listed in "Table 2-2: PJL Variables" on page 2-10.

This printer returns a ? for inquiries of an unsupported variable, or inquiries of a variable associated with an option that is not installed.

USTATUS Command

This command is used to enable and disable unsolicited status from the printer. Unsolicited status information is sent automatically when an asynchronous event occurs. Table 2-4 lists the asynchronous information that can be enabled and disabled.

Syntax:

@PJL USTATUS ustatus variable=***value***[<CR>]<LF>

Response Syntax:

@PJL USTATUS ustatus variable<CR><LF>
[one or more lines of printable characters, spaces, or tabs]<CR><LF>
<FF>

To determine which variables your printer supports, see “Table 2-4: USTATUS Unsolicited Status Variables” on this page.

See “Status Message Format” on page 2-18 for additional information about the messages returned by the INFO STATUS, USTATUS DEVICE, and USTATUS TIMED commands.

ustatus variable=***value***

The following values are supported for the ustatus variable=***value*** parameter.

Table 2-4: USTATUS Unsolicited Status Variable Values

Ustatus Variable	Value	Description
DEVICE	ON	Enables unsolicited status for device changes.
	VERBOSE	Enables unsolicited status for all device changes. Also enables warnings from the PJL parser.
	OFF	Disables unsolicited status for device changes.
JOB	ON	Enables unsolicited status for job changes. The printer sends a status message when a job begins and ends.
	OFF	Disables unsolicited status for job changes.
PAGE	ON	Enables unsolicited status for page changes. The printer sends a status message when a printed sheet reaches the standard output bin.
	OFF	Disables unsolicited status for page changes.
TIMED	5 to 300 in seconds	Enables timed unsolicited status. The printer automatically sends status at a specified time interval.
	0	Disables timed unsolicited status.

USTATUSOFF Command

This command turns off unsolicited status. Unsolicited status may also be turned off by using the USTATUS command on each variable.

Syntax:

@PJL USTATUSOFF[<CR>]<LF>

STATUS MESSAGE FORMAT

The format of the returned information from the INFO STATUS, USTATUS DEVICE, and USTATUS TIMED commands is described in this section.

INFORMATION MESSAGES

Information messages are returned in this form:

CODE=status code

DISPLAY=display string (in double quotes)

ONLINE=online status

Table 2-5: PJL Information Messages

Printer State	Status Code	Display String	Online Status
Ready	10001	Ready	TRUE
Ready	10001	RDYMSG	TRUE
Not Ready	10002	Not Ready	FALSE

3

PCL SUPPORT

PCL SUPPORT

Table 3-1 lists PCL emulation commands and identifies printers that support them.

For detailed information about PCL emulation commands and how to select them, see “PCL Emulation” on page 1-2.

The section, “GL/2 Commands” on page 1-27 identifies printer support for the GL/2 commands.

Table 3-1: PCL Emulation Commands

Supported Not Supported	Page numbers reference command descriptions		Printer Model
Command	**Function**	**Page**	**D512**
ESCE	Printer Reset	1-9	
ESCY	Display Functions-On	1-25	
ESCZ	Display Functions-Off	1-25	
ESCz	Print Test Page	1-25	
ESC&a#C	Horizontal Cursor Position (in Columns)	1-13	
ESC&a#G	Duplex Page Side Selection	1-12	
ESC&a#H	Horizontal Cursor Position (in Decipoints)	1-13	
ESC&a#L	Set Left Margin	1-11	
ESC&a#M	Set Right Margin	1-11	
ESC&a#P	Print Direction	1-11	
ESC&a#R	Vertical Cursor Position (in Rows)	1-13	
ESC&a#V	Vertical Cursor Position (in Decipoints)	1-13	
ESC&c#T	Character Text Path Direction	1-11	
ESC&d@	Underline-Disable	1-15	
ESC&d#A	Number of Collated Copies	1-9	
ESC&d#D	Underline-Enable	1-15	
ESC&f#F	Set Universal Height	1-10	
ESC&f#G	Set Universal Width	1-10	
ESC&f#O	Set Universal Feed Direction	1-10	
ESC&f#W	Set Universal Custom Name	1-10	
ESC&f#S	Push / Pop Cursor Position	1-13	
ESC&f#X	Macro Control	1-17	
ESC&f#Y	Set Macro ID	1-17	
ESC&k#G	Set Line Termination	1-13	
ESC&k#H	Set Horizontal Motion Index	1-11	

Table 3-1: PCL Emulation Commands (continued)

Supported Not Supported Command	Page numbers reference command descriptions Function	Page	Printer Model D512
ESC&k#S	Select Primary and Secondary Pitch	1-16	
ESC&k#W	Text Scale Mode	1-12	
ESC&ℓ#A	Page Size	1-10	
ESC&ℓ#C	Set Vertical Motion Index	1-12	
ESC&ℓ#D	Set Line Spacing	1-12	
ESC&ℓ#E	Set Top Margin	1-11	
ESC&ℓ#F	Set Text Length	1-11	
ESC&ℓ#G	Set Output Bin	1-11	
ESC&ℓ#H	Paper Source	1-10	
ESC&ℓ#L	Skip Perforation	1-11	
ESC&ℓ#O	Select Orientation	1-10	
ESC&ℓ#M(b)	Paper Type	1-26	
ESC&ℓ#P	Set Page Length	1-12	
ESC&ℓ#S	Simplex/Duplex Print	1-9	
ESC&ℓ1T	Job Separation	1-11	
ESC&ℓ#U	Long-Edge Offset Registration	1-9	
ESC&ℓ#X	Number of Copies	1-9	
ESC&ℓ#Z	Short-Edge Offset Registration	1-9	
ESC&n#W [operation] [string id]	Alphanumeric ID		
ESC&p#C	Palette Control		
ESC&p#I	Palette Control ID		
ESC&p#S	Select Palette		
ESC&p#X[data]	Transparent Print Data	1-15	
ESC&r#F	Flush All Pages	1-21	
ESC&s#C	End-Of-Line Text Wrap	1-25	
ESC&t#P	Text Parsing Method	1-16	
ESC&u#D	Unit of Measure	1-10	
ESC(#	Primary Font Symbol Set	1-14	
ESC(#X	Select Primary Download Font (by Font ID)	1-15	
ESC(3@	Select Default Primary Font	1-15	
ESC(f#W[data]	Define Symbol Set	1-16	
ESC(s#B	Primary Font Stroke Weight	1-15	
ESC(s#H	Primary Font Pitch	1-14	

Table 3-1: PCL Emulation Commands (continued)

Supported Not Supported	Page numbers reference command descriptions		Printer Model
Command	**Function**	**Page**	**D512**
ESC(s#P	Primary Font Spacing	1-14	
ESC(s#S	Primary Font Style	1-14	
ESC(s#T	Primary Font Typeface Selection	1-15	
ESC(s#V	Primary Font Height (Point Size)	1-14	
ESC(s#W[data]	Load Character	1-17	
ESC)#	Secondary Font Symbol Set	1-14	
ESC)#X	Select Secondary Download Font (by Font ID)	1-15	
ESC)3@	Select Default Secondary Font	1-15	
ESC)s#B	Secondary Font Stroke Weight	1-15	
ESC)s#H	Secondary Font Pitch	1-14	
ESC)s#P	Secondary Font Spacing	1-14	
ESC)s#S	Secondary Font Style	1-14	
ESC)s#T	Secondary Font Typeface Selection	1-15	
ESC)s#V	Secondary Font Height (Point Size)	1-14	
ESC)s#W[data]	Load Font Header	1-17	
ESC*b#M	Set Raster Compression Mode	1-21	
ESC*b#V[data]	Transfer Raster Data (by Plane)	1-21	
ESC*b#W[data]	Transfer Raster Data (by Row / Block)	1-22	
ESC*b#Y	Y Offset	1-21	
ESC*c#A	Horizontal Rectangle Size (in PCL Units)	1-19	
ESC*c#B	Vertical Rectangle Size (in PCL Units)	1-19	
ESC*c#D	Set Font ID	1-17	
ESC*c#E	Set Character Code	1-17	
ESC*c#F	Font Control	1-17	
ESC*c#G	Area Fill ID	1-18, 1-20	
ESC*c#H	Horizontal Rectangle Size (in Decipoints)	1-19	
ESC*c#K	GL/2 Horizontal Plot Size (in Inches)	1-25	
ESC*c#L	GL/2 Vertical Plot Size (in Inches)	1-25	
ESC*c#P	Fill Rectangular Area	1-20	
ESC*c#Q	Pattern Control	1-19	
ESC*c#R	Symbol Set ID Code	1-16	
ESC*c#S	Symbol Set Control	1-16	
ESC*c0T	Set Picture Frame Anchor Point	1-25	

Table 3-1: PCL Emulation Commands (continued)

Supported Not Supported Command	Page numbers reference command descriptions Function	Page	Printer Model D512
ESC*c#V	Vertical Rectangle Size (in Decipoints)	1-19	
ESC*c#W[data]	User-Defined Pattern	1-19	
ESC*c#X	Picture Frame Horizontal Size (in Decipoints)	1-25	
ESC*c#Y	Picture Frame Vertical Size (in Decipoints)	1-25	
ESC*ℓ#O	Logical Operation	1-18	
ESC*ℓ#R	Pixel Placement	1-18	
ESC*ℓ#W[data]	Color Lookup Tables		
ESC*m#W[data]	Download Dither Matrix		
ESC*o#M(b)	Print Quality	1-26	
ESC*o#W[data]	Driver Configuration Command		
ESC*p#P	Push / Pop Palette		
ESC*p#R	Set Pattern Reference Point	1-19	
ESC*p#X	Horizontal Cursor Position (in PCL Units)	1-13	
ESC*p#Y	Vertical Cursor Position (in PCL Units)	1-13	
ESC*r#A	Start Raster Graphics	1-21	
ESC*r#F	Raster Graphics Presentation Mode	1-21	
ESC*r#S	Raster Width (Source)	1-21	
ESC*r#T	Raster Height (Source)	1-21	
ESC*r#U	Simple Color		
ESC*rB	End Raster Graphics (Version B)	1-22	
ESC*rC	End Raster Graphics (Version C)	1-22	
ESC*s#I	Inquire Status Readback Entity	1-24	
ESC*s1M	Free Space	1-24	
ESC*s#T	Set Status Readback Location Type	1-24	
ESC*s#U	Set Status Readback Location Unit	1-24	
ESC*s#X	Echo	1-24	
ESC*t#H	Raster Width Destination	1-22	
ESC*t#I	Gamma Correction		
ESC*t#J	Render Algorithm		
ESC*t#R	Raster Resolution	1-21	
ESC*t#V	Raster Height Destination	1-23	
ESC*g#W	Set Raster Configuration	1-23	
ESC*v#A	Color Component One		
ESC*v#B	Color Component Two		

Table 3-1: PCL Emulation Commands (continued)

Supported Not Supported	Page numbers reference command descriptions		Printer Model
Command	**Function**	**Page**	**D512**
ESC*v#C	Color Component Three		
ESC*v#I	Assign Color Index		
ESC*v#N	Source Transparency Mode	1-18	
ESC*v#O	Pattern Transparency Mode	1-18	
ESC*v#S	Foreground Color		
ESC*v#T	Select Current Pattern	1-18	
ESC*v#W[data]	Configure Image Data		
ESC*i#W[data]	Viewing Illuminant		
ESC9	Clear Horizontal Margins	1-11	
ESC=	Half Line-Feed	1-13	
ESC%#A	Enter PCL Emulation	1-25	
ESC%#B	Enter GL/2 Language	1-25	
ESC%–12345X	Universal Exit Language (UEL) / Start of PJL	1-10	

Table 2 lists GL/2 commands and identifies the printers that support them.

Table 3-2: GL/2 Commands

Supported Not Supported	Page numbers reference command descriptions.		Printer Model
Command	**Function**	**Page**	**D512**
AA	Arc Absolute	1-27	
AC	Anchor Corner	1-29	
AD	Define Alternate Font	1-28	
AR	Arc Relative	1-27	
AT	Arc Absolute Three Point	1-27	
BR	Bezier Relative	1-27	
BZ	Bezier Absolute	1-27	
CF	Character Fill	1-28	
CI	Circle	1-27	
CO	Comment	1-27	
CP	Character Plot	1-28	
CR	Color Range	1-29	
DF	Default	1-27	
DI	Absolute Direction	1-28	

Table 3-2: GL/2 Commands (continued)

Supported Not Supported	Page numbers reference command descriptions.		Printer Model
Command	**Function**	**Page**	**D512**
DR	Relative Direction	1-28	
DT	Define Label Terminator	1-28	
DV	Define Variable Text Path	1-28	
EA	Edge Rectangle Absolute	1-28	
EP	Edge Polygon	1-28	
ER	Edge Rectangle Relative	1-28	
ES	Extra Space	1-28	
EW	Edge Wedge	1-28	
FI	Primary Font	1-28	
FN	Secondary Font	1-28	
FP	Fill Polygon, Odd/Even	1-28	
FP	Fill Polygon, Non-Zero Winding	1-28	
FT	Fill Type	1-29	
FT	Fill Type - 22	1-29	
FT	Fill Type - 9	1-29	
IN	Initialize	1-27	
IP	Input P1 and P2	1-27	
IR	Input Relative P1 and P2	1-27	
IW	Input Window	1-27	
LA	Line Attributes	1-29	
LB	Label, Default Terminator = ‘03’x	1-28	
LO	Label Origin	1-28	
LO	Uses PCL Label Origin	1-28	
LT	Line Type	1-29	
LM	Label Mode	1-29	
MC	Logical Operation	1-29	
NP	Number of Pens	1-29	
PA	Plot Absolute	1-27	
PC	Pen Color	1-27	
PD	Pen Down	1-27	
PE	Polyline Encoded	1-27	
PM	Polygon Mode	1-28	
PP	Pixel Placement	1-29	
PR	Plot Relative	1-27	

Table 3-2: GL/2 Commands (continued)

Supported Not Supported Page numbers reference command descriptions.			Printer Model
Command	**Function**	**Page**	**D512**
PU	Pen Up	1-27	
PW	Pen Width	1-29	
RA	Fill Rectangle Absolute	1-28	
RF	Define Raster Fill	1-29	
RO	Rotate Coordinate System	1-27	
RR	Fill Rectangle Relative	1-28	
RT	Arc Relative Three Point	1-27	
SA	Select Alternate Font	1-28	
SB	Scalable/Bitmapped Fonts	1-28	
SC	Scale	1-27	
SD	Define Standard Font	1-28	
SI	Absolute Character Size	1-28	
SL	Character Slant	1-28	
SM	Symbol Mode	1-29	
SP	Select Pen	1-29	
SR	Relative Character Size	1-28	
SS	Select Standard Font	1-29	
SV	Screened Vectors	1-29	
SV	Screened Vectors - 9, level	1-29	
TD	Transparent Data	1-29	
TM	Threshold Matrix	1-29	
TR	Transparency Mode	1-29	
UL	User Defined Line	1-29	
WG	Fill Wedge	1-28	
WU	Pen Width Units	1-29	

4

PJL SUPPORT

PRINTER JOB LANGUAGE SUPPORT

The following tables list PJL commands and identify printers that support them.

For detailed information about PJL commands, see Section 2, the Printer Job Language section, in this manual. All commands may not have a full description.

Table 4-1: PJL Variables

Supported Not Supported Page numbers reference variable descriptions and are listed for supported variables only. Default values are listed for exceptions only.		Printer Model
Variable Name	**Page**	**D512**
AUTOCONT		
AUTOSELECT		
BINDING		
BITSPERPIXEL		
CLEARABLEWARNINGS		
CONTEXTSWITCH		
COPIES	2-10	
CPLOCK		
DENSITY		
DISKLOCK		
DUPLEX		
ECONOMODE		
FORMATTERNUMBER		
FORMLINES	2-10	
HOLD		
HOLDKEY		
HOLDTYPE		
IMAGEADAPT		
INTRAY1		
INTRAY2		
INTRAY3		
INTRAY4		
INTRAY5		
INTRAY1SIZE		
INTRAY2SIZE		

Table 4-1: PJL Variables (continued)

Supported Not Supported Page numbers reference variable descriptions and are listed for supported variables only. Default values are listed for exceptions only.		Printer Model
Variable Name	**Page**	**D512**
INTRAY3SIZE		
INTRAY4SIZE		
INTRAY5SIZE		
IOBUFFER		
IOSIZE		
JOBATTR		
JOBNAME	2-10	
JOBOFFSET		
LANG		
LOWTONER		
MANUALFEED		
MEDIASOURCE		
MEDIATYPE		
MPTRAY		
ORIENTATION	2-10	
OUTBIN		
PAGEPROTECT		
PAPER		
PARALLEL		
PASSWORD		
PERSONALITY		
POWERSAVE		
POWERSAVETIME		
PRINTQUALITY		
QTY		
RENDERMODE		
REPRINT		
RESOLUTION	2-10	
RESOURCESAVE		
RESOURCESAVESIZE		
RET		
TIMEOUT		

Table 4-1: PJL Variables (continued)

Supported Not Supported Page numbers reference variable descriptions and are listed for supported variables only. Default values are listed for exceptions only.		Printer Model
Variable Name	**Page**	**D512**
USERNAME		
WIDEA4		

Table 4-2: Common Variables for PCL Emulation

Supported Not Supported Page numbers reference variable descriptions.		Printer Model
Variable Name	**Page**	**D512**
FONTNUMBER		
FONTSOURCE		
PITCH		
PTSIZE		
SYMSET		

Table 4-3: Common Variables for PostScript Emulation

Supported Not Supported Page numbers reference variable descriptions.		Printer Model
Variable Name	**Page**	**D512**
JAMRECOVERY		
PRTPSERRS		
ADOBEMBT		

Table 4-4: Status Readback Commands

Supported Not Supported Page numbers reference command descriptions.		Printer Model
Command Name	**Page**	**D512**
Dinquire	2-12	
Echo	2-13	
Info	2-14	
Inquire	2-15	
Ustatus	2-16	
Ustatusoff	2-17	

Table 4-5: USTATUS Unsolicited Status Variables

Supported Not Supported Page numbers reference variable descriptions.		Printer Model
Variable Name	**Page**	**D512**
DEVICE	2-16	
JOB	2-16	
PAGE	2-16	
TIMED	2-16	

Table 4-6: Device Attendance Messages

Supported Not Supported Page numbers reference message descriptions.		Printer Model
Message	**Page**	**D512**
RDYMSG		
OPMSG		
STMSG		

5

BARCODE COMMANDS

BAR CODE COMMANDS

Table 5-1: PCL Emulation Escape Sequences

Command / Parameters	Function / Result
ESC(s#P or ESC)s#P	Determines the location of human-readable text printed with the bar code. 0 Use default value 1 Do not print text 4 Print text under bar code 5 Print text above bar code **Example: ESC(s4p24670T** Select Code 3 of 9 with human-readable text under the barcode. Because the v and h parameters are not specified, their values default to: v 0.4 inch h automatically sized Roman Pillar bold

ESC(s#H
or
ESC)s#H
	Selects the font used for human-readable text. The numeric value of # is of the form CBA, where:
	A = typeface 0–5 **Note:** The valid range is 0 to 5, regardless of the selection, the human-readable is printed with Roman Pillar Bold.
	B = size 0 Automatic font size (default)
	C = style 0 Default (bold), 1 Bold, 2 Bold Italic, 3 Bold, 4 Bold Italic
	Example: ESC(5p504h24671T
	Selects Code 3 of 9 with check digit with automatically sized Roman Pillar Bold Italic text above the bar code. Because the v parameter is not specified, it value defaults to:
	v 0.7 inch

ESC(s#V or ESC)s#V	**Selects the height of the bar in points (1/72 inch).** Except in symbologies where #V is a fixed value, the bar height can be varied from a minimum of 3 points (0.04 inch, 1 mm) to a maximum of 960 points (13.33 inch, 33 cm). **Example: ESC(s36v24750T** Selects the Codabar symbology with a bar height of 0.5 inch. Because the p and h parameters are not specified, their values default to: p Do not print text h Not applicable because of #p parameter value

Table 5-2: PCL Emulation Parameter List

Command	Function / Parameter (#v units are in 1/72")					
ESC(s#T or ESC)s#T	Select the bar code symbology.	Default Parameters[1]		Characters Encoded	Symbol[2] Length	Checksum Character
Typeface #	Bar Code Symbology	#v	#p			
24600	UPC-A	74.4	4	N	11	Yes[3]
24601	UPC-A + 2-digit supplemental	74.4	4	N	13	Yes[3]
24602	UPC-A + 5-digit supplemental	74.4	4	N	16	Yes[3]
24610	UPC-E	28.8	4	N	6	Yes[3]
24611	UPC-E + 2-digit supplemental	28.8	4	N	8	Yes[3]
24612	UPC-E + 5-digit supplemental	28.8	4	N	11	Yes[3]
24620	EAN/JAN-8	50.4	4	N	7	Yes[3]
24621	EAN/JAN-8 + 2-digit supplemental	50.4	4	N	9	Yes[3]
24622	EAN/JAN-8 + 5-digit supplemental	50.4	4	N	12	Yes[3]
24630	EAN/JAN-13	74.4	4	N	12	Yes[3]
24631	EAN/JAN-13 + 2-digit supplemental	74.4	4	N	14	Yes[3]
24632	EAN/JAN-13 + 5-digit supplemental	74.4	4	N	17	Yes[3]
24640	Interleaved 2 of 5	28.8	1	N	Even	No
24641	Interleaved 2 of 5 + check digit	28.8	1	N	Odd	Yes
24650	Industrial 2 of 5	28.8	1	N	---	No
24651	Industrial 2 of 5 + check digit	28.8	1	N	---	Yes
24660	Matrix 2 of 5	28.8	1	N	---	No
24661	Matrix 2 of 5 + check digit	28.8	1	N	---	Yes
24670	Code 3 of 9	28.8	1	M	---	No
24671	Code 3 of 9 + check digit	28.8	1	M	---	Yes
24672	Code 3 of 9 space encoding	28.8	1	M	---	No
24673	Code 3 of 9 space encode +check digit	28.8	1	M	---	Yes
24680	Code 3 of 9 extended	28.8	1	M	---	No
24681	Code 3 of 9 extended + check digit	28.8	1	M	---	Yes
24690	Code 93	28.8	1	M	---	Yes
24691	Code 93 extended	28.8	1	M	---	Yes
24700	Code 128 autoswitch	28.8	1	M	---	Yes

[1] For bar code symbologies, the default value of the #H text font parameter is CBA = 000 (automatically sized Roman Pillar bold).

[2] Does not include checksum character.

[3] Checksum character is always printed if human-readable text is specified.

* = Fixed value, cannot be changed
N = Numeric
M = Mixed

Table 5-2: PCL Emulation Parameter List (continued)

Command	Function / Parameter (#v units are in 1/72")					
ESC(s#T or ESC)s#T	Select the bar code symbology.	Default Parameters[1]		Characters Encoded	Symbol[2] Length	Checksum Character
Typeface #	Bar Code Symbology	#v	#p			
	Code 128 A	28.8	1	M	---	Yes
	Code 128 B	28.8	1	M	---	Yes
	Code 128 C	28.8	1	M	---	Yes
	UCC 128	28.8	5	M	---	
	EAN 128	28.8	1	M	---	Yes
	Codabar	28.8	1	M	---	No
	Codabar +MOD 16 check digit	28.8	1	M	---	Yes
	MSI	28.8	1	N	---	No
	MSI + mod10 + mod10 check digits	28.8	1	N	---	Yes
	MSI + mod10 + mod10 check digits	28.8	1	N	---	Yes
	MSI + mod11 + mod10 check digits	28.8	1	N	---	Yes
	POSTNET 5-digit ZIP code	9*	1*	N	5	Yes
	POSTNET 9-digit ZIP code	9*	1*	N	9	Yes
	POSTNET 11-digit Delivery Point Code	9*	1*	N	11	Yes
	MaxiCode	---	1	Y	1' square	Yes
	PDF417	---	1	Y	---	Yes

[1] For bar code symbologies, the default value of the #H text font parameter is CBA = 000 (automatically sized Roman Pillar bold).

[2] Does not include checksum character.

[3] Checksum character is always printed if human-readable text is specified.

* = Fixed value, cannot be changed
N = Numeric
M = Mixed

CURSOR POSITIONING

Cursor positioning is set as follows when printing with the Sato Bar Code Option:

- From the current cursor position, bar code printing begins at the bottom left corner of the left bar.
- The cursor is located at the bottom right corner of the right bar when printing is complete.
- This cursor positioning applies both with and without accompanying human-readable text.

TWO-DIMENSIONAL BAR CODES

MaxiCode PCL 5 Commands to Support MaxiCode Bar Codes

Sato provides two methods to print MaxiCode bar codes. The final method uses two Sato unique commands ESC&x#W and ESC&y#W.

Bar Code Descriptor ESC&x#W[descriptor data]

This escape sequence is used to describe not only what bar code to print, but also all of the parameter settings required to build the bar code. The first two bytes of this command always designate the symbology. The remaining byte is then interpreted to specify the mode. # is the number of bytes of descriptor data. The descriptor data for MaxiCode would be the binary string 00 02 01 (for mode 1), 00 02 02 (for mode 2), and so on.

Transfer Bar Code Data ESC&y#W[bar code data]

This new PCL 5 command is used to transfer a raw block of bar code data to be encoded. The bar code data is encoded according to what was specified in the last valid Bar Code Descriptor command received. If no valid Descriptor is sent, then this command is ignored and the data is flushed. # is the number of bytes of bar code data.

Bar Code Descriptor for MaxiCode

Below is the header definition of the bar code descriptor for MaxiCode:

Table 5-3: MaxiCode Descriptor Header Definition

Bytes	MSB	LSB
0–1	Symbology ID byte (00x)	Symbology ID byte 2 (02x)
2–3	Mode	Reserved

Symbology ID bytes 0 and 1: (Required = 00 02x)
These two bytes signify the symbology. For MaxiCode, these two bytes must be 00x and 02x.

Mode: (Default = 02x)
This field designates what mode to use when interpreting the input data. Valid modes are (in hex).

Table 5-4: MaxiCode Mode Values

Bytes	MSB
02x	Structured carrier message with numeric postal code
03x	Structured carrier message with alphanumeric postal code
04x	Standard symbol with standard error correction
05x	Full symbol with enhanced error correction
06x	Reader Program with standard error correction

MaxiCode Notes

Depending on the mode, the input data sent with the Transfer Bar Code Data command must follow the following rules:

Rule 1: For all modes the input data must start with a label-number field and number-of-labels field. Both fields are one digit in length and are terminated with either a comma or Group Separator (GS, ASCII 29, hexadecimal 1D).

Rule 2: For modes 2 and 3 there are 3 extra fields that must follow the label fields. These include the postal code, country code, and class of service. Each field must be terminated with either a comma or GS.

Rule 3: A mode 2 postal code can be 0 to 9 digits.

Rule 4: A mode 3 postal code can be 0 to 6 alphanumeric characters (any printable character in code set A as defined in AIM spec).

Rule 5: The country code must be 3 digits in length and thus padded with leading zeros if necessary.

Rule 6: The class of service must be 3 digits in length and thus padded with leading in zeros if necessary.

Rule 7: For modes 2 and 3 an optional ANSI Message Header (for example [)>**RS**01**GS**yy) can be inserted prior to the postal code. (**RS** = record separator, ASCII 30, hexadecimal 1D;yy is a two digit year). This message is automatically moved to the secondary message. Neither a group separator nor a comma should terminate this message.

An optional secondary message follow the class of service for modes 2 and 3. For modes 4, 5, and 6 the message follows the number-of-labels field.

MaxiCode Examples using Transfer Bar Code Data Command

Here are some MaxiCode examples of the ASCII data that would be sent with the Transfer Bar Code Data Command:

Mode 2, separated with commas:
ESC&y48W1,1,40361,840,001,This is the secondary message.

Mode 3, separated with commas:
ESC&y48W1,1,ABC01,840,001,This is the secondary message.

Mode 3, separated with GS and commas plus optional ANSI Message Header (yy=99):
ESC&y45W1,1,[)**RS**01**GS**99ABC01**GS**840**GS**022**GS**secondary message

Mode 4, separated with commas:
ESC&y28W1,1, Here is a mode 4 message

Human-Readable Text

Because two-dimensional bar codes are capable of encoding thousands of characters, human-readable interpretation of the data may not be practical. Alternatively, descriptive text rather than literal text may be printed with the symbol. If printed, any character size and font available may be selected, and the text may be printed anywhere desired near the symbol. The text must not interfere with the bar code symbol or the quiet zones.

Functional Parameters for MaxiCode (Typeface Selection Method)

The data sent when using this second technique of printing MaxiCode symbols will follow the same rules that exist for data sent using the Transfer Bar Code Data Command to print MaxiCode symbols, with the following change to rule 1. (See “Rule 1” on page 2-6.) The input data must start with a label-number field, a number-of-labels field, and a mode field. All three of these fields are one digit in length and are terminated with either a comma or Group Separator (GS, ASCII 29).

Example of MaxiCode commands using typeface selection:
ESC(s24800TESC&p105X1,1,3,152382802,840,001,[)
RS01GS961Z00004951**GS**UPSN**GS**06X610**GS**159GS1234567**GS**
1/1**GS**10**GS**Y**GS**634 ALPHA
DR**GSGS**PITTBURGHGSPA**RS**

Where:

ESC=escape character decimal 27, hexadecimal 1B
RS=record separator decimal 30, hexadecimal 1E
GS=group separator decimal 29, hexadecimal 1D

FUNCTIONAL PARAMETERS FOR PDF417

The #p parameter specifies the level of error correction to use: 0–8. In relation to the fields of the Sato Bar Code Descriptor for PDF417, the following correspondences exist when using this technique:

ECC Level	Specified by #p parameter

Examples of PDF 417 commands:

ESC(s0p24850TABCDEFG

Encodes the string “ABCDEFG” in a PDF417 symbol with error correction level 0.

6

PRINTER LANGUAGE CHANGE COMMANDS

- **Setting the printer to SBPL**
- **Setting the printer to PCL**

SETTING THE PRINTER TO SBPL LANGUAGE

This chapter discusses setting the printer to the SBPL language, and setting the printer to PCL language.

Command to set SBPL Language

The SBPL command sets the printer to SBPL mode and causes all subsequent data to be processed as SBPL data. The change is retained even if the printer is turned off.

Syntax:

@PJL ENTER LANGUAGE=SBPL<CR><LF>

Response:

None

SETTING THE PRINTER TO PCL LANGUAGE

Command to set PCL Language

PCL Language Set Command	ESC+RN

The PCL command sets the printer to PCL mode. The change is retained even if the printer is turned off.

Command Function:

To set the printer language to PCL.

Command Structure:

<ESC>A

<ESC>RN

<ESC>Z

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